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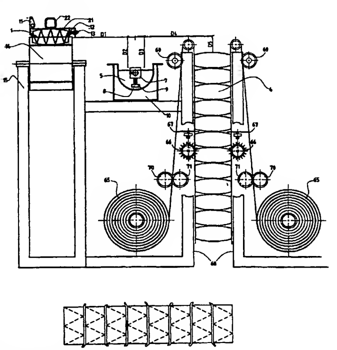
(54) Title: METHOD AND MACHINE FOR THE ASSEMBLY OF INNERSPRING UNITS FROM POCKETED SPRINGS, AND INNERSPRING CONSTRUCTION



(57) Abstract: This invention describes a method and a machine for making inner spring units from pocketed springs, by depositing a hot melt adhesive on the springs' surfaces. It also describes an innerspring construction from pocketed springs that utilizes a sheet of fabric or non-woven to hold the springs together in such a way that the springs keep their independence although attached to the sheet. Application of the adhesive is done by transferring hot melt material from a pool and depositing it on to the springs' surface. Several devices are proposed for this transfer. Some of them are, rotating stamps, translating and rotating plates which apply the glue simultaneously on all springs of a row, as well as a traveling mechanism which uses rolling disks to deposit the glue progressively on the springs of a row. Other mechanisms have also been devised for cutting, gripping, transferring and assembling a row of pocketed springs. The pocket spring construction described here makes use of two sheets of fabric or non-woven which are attached to the flat surfaces of the springs. They are rippled, so that when a certain spring is depressed there is enough extra sheet material to allow the spring to move without pulling its neighboring springs down with it.

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METHOD AND MACHINE FOR THE ASSEMBLY OF INNERSPRING UNITS FROM POCKETED SPRINGS, AND INNERSPRING CONSTRUCTION

BACKGROUND

The present invention refers to a method and a machine for the production of innerspring units (Fig. 1a, b, c) which are produced by gluing parallel rows (strips) of springs (Fig. 1d, item 1). The springs (4) are entrapped in strips of cloth (3) or non-woven material (3), where the gluing of the spring rows to each other is done with liquid glue, which is stamped on the sides of the spring rows. The innerspring construction which is described, possesses the quality of having a sheet of cloth or non-woven glued to its flat surfaces and, at the same time, maintaining independence of the individual springs.

All known applications for production of mattresses are based on spraying of glue through orifices on to the surface of the spring row and on subsequent pressing of each spring row on to other rows.

The product is commonly produced manually. A worker receives one row of springs, places it on a table, and sprays glue with a spray gun on the cloth or on the non-woven material, which contains the springs. Following this, he rotates the spring row and carries it inside a guide, where all the already glued spring rows have been placed, and then he and presses it in order to be glued to the previous spring rows. The process is time-consuming and costly, and the product is not of high quality, since the glue is not uniformly spread.

In patent EP 0 764 608 A1 the spring rows are inserted inside a guide, where they are sprayed on their upper side, through a sprinkler, which is supported on a moving frame and moves along the length of the spring row, spraying its surface with glue.

Patent US 5,988,253 refers to the same method and machine as in patent EP 0 764 608 A1. The spring rows are fixed and a sprinkler, which moves along the length of the spring rows, sprays them with glue.

In patent EP 0 421 495 A1 the glue is sprayed by a sprinkler, whereas the spring row advances through a conveyor belt.

In patent US 5,637,178 there is reference to the same method and machine as in patent EP 0 421 495 A1. The glue is sprayed by a sprinkler on a moving spring row.

In patent EP 0 624 545 A1 the spring rows are sprayed with glue by a sprinkler, which moves along the length of the rows.

In patent DE 4 031 652 A1 it is proposed that the glue is spread continuously, at a certain width along the side of each spring row.

In patent US 4,566,926 it is proposed that the spraying of the glue on the spring row is performed by four sprinklers simultaneously, whereas the sprinklers move in parallel to the spring row.

In patent EP 0 421 496 A1 it is proposed that the spraying of the glue on the spring row is done in such a manner, that all the width of the spring row (length of a spring) is covered by glue, whereas the sprinkler is fixed and the spring row is moving.

In patent WO 98/10933 it is proposed that the spraying of the glue on the spring row is done by a sprinkler, which moves along the length of the spring row.

In patent US 4,578,834 it is proposed that the spraying of the glue on the spring row is performed by a sprinkler, which is moving with respect to the spring row.

In patent DE 4031651 it is proposed that adhesive tape is used for the gluing between two spring rows.

In patent WO 97/37569 it is proposed that the laying of the glue, in various shapes, on each spring row is performed by a nozzle.

SUMMARY

In all of the above patents the laying of the glue on the spring rows is performed either by spraying through sprinklers or by nozzle, whereas the moving part is either the glue laying mechanism or the spring row. In some patents, adhesive tape is used to connect two rows to each other.

The aim of the present invention is the connection of the spring rows with glue, where instead of spraying the glue through sprinklers, the glue is transferred to the springs by a stamp, which is previously submersed in a glue bath (tank) or with any other way glue can be placed on the stamp surface.

The stamp (8), illustrated in Figure 2a can be submersed in the glue tank (or glue can flow on it) and every time the spring row is at the proper position, a stamping mechanism is activated, and the stamp with glue on its surface (Fig. 2) is pressed, with the required pressure, on the surface of the non-woven material or the cloth of the row (1). It is also possible that the row is pressed on the stamps, instead.

The simultaneous deposition of glue on the spring row through stamps has the advantages, that similar conditions apply to all the gluing locations, since the temperature and density, and hence the gluing properties of each glue type, varies with time. This is particularly true for hot melt adhesives.

In this invention, by using stamps for depositing glue on the surface of the spring row, we obtain uniform conditions of gluing throughout the length of the spring row, we optimize the gluing by selecting the most appropriate glue temperature, and we

minimize the time between glue deposition on the surface and transfer of the row on the previous row. Each row that has been stamped with glue is positioned above and in parallel to the previous row, so that the spring axes are parallel to each other.

Stamping of the surface with glue also presents the following properties. The pressure of stamping can be regulated, so that with each contact, part of the glue penetrates the non-woven material or cloth, entering the pores, and because it cools faster than the rest of the glue mass on the surfaces, it creates a thin solid layer, which upon pressing of the spring row on the previous one, acts as a solid and elastic surface, pushing the surface glue to penetrate the pores of the non-woven material or cloth of the previous row. This way, by using glue stamping, the optimal gluing with the use of only the required quantity of glue is obtained.

The shape of the stamps can vary in length, width and even in depth, where the shape can be formed in hollow shape, so that it can receive a larger volume of glue. This way, the operator of the machine can select the proper stamps, depending on the shape of the springs. The most appropriate location for applying the glue is at the surface under the spring rows, when the longitudinal axes of the pocketed springs are horizontal.

For shortest travel of the glue from the glue tank to the side of each spring row, a slender tank, spanning the length of a row, is used. Therefore, since the time of movement lasts only a few seconds, no unwanted cooling of the glue occurs, the operation speed is uniform and the stamping is simultaneous.

In a preferred implementation, each stamp is supported on a spring base (9), as shown in Figure 3, which can adjust to the irregular shape of the row surface, at each contact point along its length. This contributes to uniform spread of the glue.

Furthermore, when the spring rows must be glued in a nested arrangement instead of orthogonal two sets of stamps (8) are required for each spring, with inclined surfaces at about 60^0 (Fig. 6), thus stamping each pocket cloth on two locations at the side surfaces.In case hot melt glue is used, uniform heating of the glue is achieved through a double-jacketed tank with heating oil.

Due to the uniform oil temperature, a constant glue temperature is maintained. This way, the glue does not get in contact with hot heating sources, as it is done until now, and consequently, the glue properties are not altered and its heating is uniform. The method of repeated submersion of the stamps, which is implemented for gluing also has the benefit of stirring up the bath of the glue, thus assuring a uniform temperature throughout the glue volume.

Attaching rows of pocketed springs to each other can be done by gluing the springs together, as described above, or by gluing a sheet of fabric or non-woven to the springs' flat surfaces, or through a combination of the two. This method prescribes deposition of hot melt glue on the flat surfaces of the springs which are subsequently attached to the sheet. Two sheets, one for each surface of the mattress, are positioned on the respective sides of a holder where the rows of springs are placed after glue

deposition. This process is repeated until mattress completion. In the end, the sheet is cut by a device which travels in a direction perpendicular to sheet movement.

The outcome of this process is an innerspring unit of pocketed springs with a sheet of fabric or non-woven glued on to its flat surfaces. Other methods simply attach a sheet on the springs resulting in reduced independence of the springs. With our method we can control sheet tension in the direction of sheet movement and in the direction perpendicular to its movement. Consequently, the surface of the sheet is rippled along its length and along its width. Mattress stiffness and spring independence in all parts of a mattress are therefore controllable.

This is achieved through the independent control of sheet tension and spring positioning, which allows us to place the rows of springs as densely or sparsely as we desire into stretched or rippled sheet.

The present method and machine are described with the aid of the following figures:

Figure. 1 describes the final product mattress and the row, which it is manufactured from.

Figure. 2 describes the method of glue transfer through a stamp and the spring, which supports the stamp.

Figure. 3 describes the method of glue transfer through a stamp and a schematic representation of the spring, which supports the stamp.

Figure. 4 describes the spring compression for cutting and welding of the non-woven material.

Figure. 5 presents an implementation with multiple (3) stamping for each spring row.

Figure. 6 presents the implementation with two stamps per spring.

Figure. 7 presents the pick-up and transfer of each spring row.

Figure. 8 presents the cutting - welding of the rows.

Figure. 9 presents a cross sectional view of the machine.

Figure. 10 presents a side view of the machine.

Figure. 11 presents a cross sectional view of the machine, at the level of the glue transfer mechanism.

Figure. 12 presents a cross sectional view of the machine, at the level of the production of mattress.

Figure. 13 shows a pocketed spring row gripper that utilizes needles.

Figure. 14 illustrates glue deposition on springs by means of long metal plates.

Figure. 15 describes a traveling glue transfer mechanism.

Figure. 16 shows the assembly machine configuration that uses sheets of fabric or non-woven.

Figure. 17 shows an innerspring construction with rippled sheets of fabric or non-woven on it main surfaces.

Figure. 18 shows the cylinders with the sinusoidal lateral surfaces.

DETAILED DESCRIPTION

The present machine operation consists of the transfer of the continuous spring row through the various processing phases, as illustrated in Figures 9 and 10: Two independent transfer systems (14), (16) each consisting of a conveyor belt, which has vertical separators along its length, are used for entrapping the springs of the spring row, which are maintained at a constant distance from each other.

The two transfer systems are placed in series, in order to carry the desired number of pocketed springs and then stop. Between the two transfer systems, there exists enough room for the cutting mechanism (63), (64), which cuts the row at the appropriate length.

The cutting mechanism that separates the non-woven material (Fig. 8) consists of two arms, located on both sides of the surface to be cut. Cutting always occurs between two pocketed springs. Each cutting requires two simultaneous welds. Otherwise, by cutting the non-woven material between two consecutive springs, the two springs are released from their pockets.

With the present method, cutting and welding of the two sides of the non-woven material is done simultaneously and with a simple method. Two welds (one before and one after cutting) are obtained with a single thermal resistance (27), which is activated when the two arms have gripped the row at the cutting location. Activation of the resistance results in the melting of the non-woven material, and the implementation of the non-woven material cutting.

At the same time, the four edges of the non-woven material are immobilized for a short while (Fig. 4) at the cutting location, until they sufficiently cool from the previous melting during the cutting, and finally obtaining welding of their two edges. In this way, one cut and two welds are obtained simultaneously. Since the four sides of the non-woven material have a tendency to move away from the cutting location, they are kept firmly pressed, until they are cool enough to produce a weld. In case

they are not kept pressed, they four sides move away from each other and cannot be welded.

There is a variety of materials, which are used for cutting. One implementation is the following (Figure 8) : One of the arms (63) supports along its length the electric resistance (27), which is bare, without a coating, and is set on a heat-resistant material (meganite) or any other similar material, whereas behind it is the main body of the arm (Fig. 8).

The surface of the other arm (64) is covered with silicon (29), in order to provide the necessary elasticity, where the silicon is covered by a heat resistant material (e.g. Teflon) (62). After the cutting of the non-woven material, the bare resistance (27) contacts on the Teflon.

In order to eliminate the tendency of the four sides of the non-woven material to move away from each other, at the cutting location, the following two methods are used for their entrapment (Fig. 4). Pressing (51) towards the cutting location and compression of two neighboring springs by their sides (52), in order to eliminate the forces acting on the non-woven material.

Fed from storage or directly from the machine where they are produced, the spring rows are pulled by the first transfer mechanism (16), which advances the row to the second transfer belt (14), which measures the length of the row and stops.

Row cutting follows. The row is then received by a transfer frame (22), which grips the row along the direction of its length, where the transfer frame (22) has on one of its long sides a metal plate (12), where its distance from the center of the transfer frame is regulated, in order to be able to work with rows of various spring dimensions.

This surface is characterized by a slight inclination. The other side of the springs of this row is held by a longitudinal surface (11), which can rotate about a longitudinal axis, where one of its sides is supported, whereas its other side is rotated in such a way that it is pressing the springs towards the fixed side of the transfer mechanism. This way, the transfer mechanism manages to align and at the same time hold the springs.

An alternative to entrapping the row of springs between two surfaces is the use of vertical needles, which are located in two rows, parallel to the row of springs, all needles of one row opposite to the needles of the other row respectively. The rows of needles can move towards each other or away from each other. The needles enter slightly the surface of the springs' enclosure and, by moving as described above, they hold the row of springs. An application example is shown in Figure 13, where the needles are secured on two axles which rotate and move the needles.

In the next step, the transfer frame (22) moves horizontally (Figure. 9), for a distance D1, carrying the spring row parallel to the conveyor belt, and bringing it above the glue tank, which contains the hot melt glue.

The surfaces, which are used as stamps (8), are submersed in the glue, and are supported along the length of the tank on bases which are independent of each other (9), through springs, where the bases are firmly attached to a shaft (6), which is capable of rotating, and which spans the length of the tank.

The glue surface can be such that, upon rotation of the shaft (6), at the lower point the stamps are inside the glue mass, whereas at the upper point the stamps are above the glue surface, ready to perform stamping. Following this, the transfer frame (22), carrying the spring row, is lowered (Figure. 9) for a distance D2, making contact with the stamping devices, which lay the proper amount and shape of glue on the spring row surface.

In the next step, the transfer frame (22) moves upwards (Fig. 9), for a distance D3, and starts moving again parallel to the row longitudinal axis (Figure. 9), for a distance D4, towards the location where the previous spring row is placed. The new row is pressed lightly on the previous row (Fig. 9), at a distance D5. This way, gluing between two rows is succeeded. This operation is repeated until all the required rows for producing a mattress are glued together.

Figure 14 is a variation of the glue application method by means of contact deposition. According to this method, glue is deposited on the convex surface of the springs (Figure. 14a), as well as on their flat surfaces (Fig. 14b). The glue on the convex surface is used for fastening springs to each other, while the glue on the flat surfaces is used for the attachment of the sheets. These two mechanisms can function independently or in concert, so that we can deposit glue on one of the surfaces or any combination of surfaces at a time. Similar to the stamp method, long metal plates are submersed in molten glue and, as they are raised, they transport glue from the glue bath to the springs.

Glue deposition onto the springs can also be achieved by a traveling carrier which contains molten glue, and a deposition mechanism, which picks up and delivers glue as it moves. This device is illustrated in Figure 15. The carrier (73) moves along the length of the row of springs. The wheels (74) are partially submersed in the glue and roll as the carrier moves. Their rotation results in transporting glue from their submersed sector to the sector that contacts the springs. From there, the glue is deposited onto the springs.

The difference between the present method, where the laying of the glue is performed by means of stamps, and previous methods, where the glue is sprayed on the surface is significant. The sprayed glue falls in an uncontrolled manner, creating an arbitrary shape, whereas the glue quantity is not constant and the gluing is not proper.

Furthermore, the possibility to transfer glue to all the encased springs, in comparison to the previous methods, where glue is sprayed at springs, one at a time, provides a significant advantage to the present machine, which has a direct bearing on its large production capacity.

According to all the above methods, construction of the innerspring unit is accomplished through gluing the convex surfaces of the springs. Below is the description of a method which utilizes a sheet of fabric or non-woven material for attaching the rows of springs to each other.

In this case, the machine of Figure 9 has the configuration of Figure 16. Two rolls of fabric or non-woven (65) are placed on the two sides of the innerspring unit holder. The sheet is unwound and laid on the flat sides of the holder (68) in such a way that the rows of springs that will be put in will come in contact with the sheet. After depositing glue on the top and bottom of the springs the row of springs is placed in the holder and as it is pressed down it pulls the sheet.

The sheet movement is aided by the spiked wheels (66) which are activated synchronously with the transfer frame which presses downwards. The spikes on the wheel surface enter slightly the surface of the sheet and pull it efficiently. When the required length of innerspring unit has been constructed the spiked wheels can pull the sheet further in order to form a separating gap between the one innerspring unit and the next.

The process of making mattresses is continuous, producing the one innerspring unit after the other. The sheet between two mattresses is cut by cutting mechanisms (67). Such an example is the disk knives of Figure 16, each of which is capable of rotating about a vertical axis which passes through its center and also of translating in a direction perpendicular to the motion of the sheet.

In case part of the rolls' length needs to be removed (not needed in the final product), or the length of the roll must be separated into two or more parts (for the construction of cushions) vertical cutting mechanisms (69) are employed, which remain stationary but their operation is based on the relative movement of the sheet. Such mechanisms may be placed at any number and location along the longitudinal axis of the roll. Their positions can be adjusted to the particular needs of the products.

The spiked wheels mentioned above, normally pull the sheet in synchronization with the row of springs which is pushed into the holder. However, they can pull more fabric than is needed to cover each row of springs, thus creating ripples on the corresponding surface of the innerspring unit, as shown in Figure 17. As a result, when the mattress is put to use, a spring which is loaded can change in length without pulling down its neighboring springs because the extra sheet gives it extra freedom. This way, the springs have increased independence and the corresponding section of the bed feels softer.

The above rippled surface is created in the direction in which the sheet moves. The same effect can be achieved in its perpendicular direction. In this case, two cylinders are used (70, 71) with sinusoidal lateral surfaces which fit to each other as shown in Figure 18. The sheet, which passes between them, copies the surfaces of the cylinders and maintains it even when it is attached to the springs. Furthermore, moving the cylinders towards and away from each other, the amplitude of the ripples on the sheet

can be varied from zero (no contact between the cylinders, i.e. a flat sheet) to full copy of the cylinder surface.

One more function performed by the spiked wheels is resistance to the motion of the innerspring unit. When combined with roll breaking, this function results in resisting the motion of the in-coming row of springs. Consequently, the springs have increased density, thus giving the feeling of a hard mattress.

CLAIMS

1. Method for the assembly of mattresses (4) from a single continuous strip of cloth (3) or non-woven material (1), which encases springs (2), where the strip (3) is cut at the desired lengths, each cut length (spring row) is carried through a transfer frame (22) to the location where glue is applied at its surface, and then each spring row is placed on top of the previous row, thus creating the mattress, where a characteristic of the method is that advancement of the spring rows is implemented by two independent transfer systems (16), (14) and cutting of the spring rows is implemented through a cutting mechanism, located between the two transfer mechanisms, which cuts the continuous spring row at specified lengths and at the same time it welds the sides of the non-woven material, which are created after the cutting, so that the springs are not released from their encasement, where after cutting, each spring row is held firmly by a longitudinal gripper (11), (21), which is attached on the transfer frame (22), and it is carried near the warm glue tank (5), where the slender tank is at least as long as the spring row, and the glue is transferred on the surface of the non-woven material or cloth exactly where the springs are encased, through the appropriate number of stamps (8), which are equal to the number of encased springs, where the stamps sink inside the glue tank in order to receive the glue, and then each glued spring row is carried on top of the previous row where it is pressed in order to be glued with the previous row, where upon consecutive gluing of rows, the total of the spring mattress (4) is produced, either with rectangular or cellular type arrangement of the spring rows.

2. Method for the assembly of mattresses from continuous strips of pocketed springs as in claim 1, where for the creation of a nested type arrangement of spring rows, two stamps with inclined surfaces which are tangent to the springs' convex surface are employed in order to stamp with glue the areas of a spring row which row is placed in a diagonal manner, with respect to the previous row.

3. Method for the assembly of mattresses from continuous strips of pocketed springs as in claim 1, where the slender glue tank is at least as long as the length of the spring rows to be glued, and is placed parallel to and near the assembled rows, so that the traveled distance of the hot melt adhesive (5) which is carried on the stamps' surfaces is short.

4. Method for the assembly of mattresses from continuous strips of pocketed springs as in claim 1, where the stamps (8) are supported at one edge of the springs (9), which springs are supported on a shaft (6), which is located inside the glue tank (5) and which extends at all the length of the glue tank, being able to rotate, enforcing the sinking of the stamps inside the warm glue, and then by further rotation, enforcing the emergence of the stamps above the glue surface, at a location where the transfer frame (21) can lower the spring row (1), so that contact and stamping is obtained.

5. Method for the assembly of mattresses from continuous strips of pocketed springs as in claim 1, where the transfer frame (21), which is used to carry the spring rows, holds firmly the spring rows through a gripper (11), then moves in a direction

parallel to the longitudinal axis of the row and at the horizontal plane, and carries the spring rows above the elongated glue tank, where after the emergence of the stamps above the glue surface, the transfer frame (21) lowers the attached spring row until simultaneous contact with all the stamps along the row length is obtained upon slight pressing and taking advantage of the elasticity of the stamps' (8) springs (9), where after the gluing operation is completed, the transfer frame, moving horizontally, carries the glued row above the previous rows, and then moving downwards is pressing the new on the previous glued with each other rows, where after a while the transfer frame releases the gripping of the spring row and returns to its initial location, ready to repeat operation.

6. Method for the assembly of mattresses from continuous strips of pocketed springs as in claim 1, where the cutting of strips made of non-woven material at the desired lengths is performed by two arms (63), (64), which can move vertically and opposite to each other, at a plane perpendicular to the longitudinal axis of the strip, which strip is gripped exactly between two encased springs, where one arm carries an electric resistance (27) extending at all its length, which resistance is placed on the heat resistant material meganite (28) or any other similar material, and where the other arm carries at the same length silicon (29) coated with Teflon (62), where after activation of the electric resistance the non-woven material melts, thus separating each strip at two pieces, whereas at the same time the four edges of the non-woven strip, two on each side of the cut, remain immobilized, since the forces that are pulling them are cancelled, and the cut and welded immobilized edges can be cooled off and be re-welded again, one welding in each side of the cut, so that the springs remain still entrapped.

7. Method for the assembly of mattresses form continuous strips of pocketed springs as in claims 1 and 6, where the gripping of the two cut non-woven material surfaces, before and after the location of the cut, is implemented with two methods that can be applied simultaneously or selectively, where the first method is the pressing of the non-woven material from four edges (52) at the location of the cutting, and the second method is the pressing of the sides of the two neighboring springs at the location of the cutting (51).

8. Method for the assembly of mattresses from continuous strips of pocketed springs as in claim 1, where two independent transfer mechanisms (16), (14) in a row are available, where the second transfer mechanism (14) is able to move independently, so that it receives the cut spring rows, it advances them at pre-programmed positions, so that when the spring rows move transversely to their longitudinal axis, glued and placed one on top of the previous one, then, due to different length of each row, they can form various shapes of mattresses or seats, such as round, rectangular, trapezoid, and even shapes where there are empty spaces in between.

9. Machine for the assembly of mattresses (4) from a single continuous strip (1) of cloth or non-woven material, which contains encased springs, and which is cut at the desired lengths, each cut length (spring row) is carried through a transfer frame (21) to the location where glue is applied at its surface, and then each spring row is

placed on top of the previous row, thus creating the mattress (4), where a characteristic of the method is that advancement of the spring rows is implemented by two independent transfer systems (16), (14) and cutting of the spring rows is implemented through a cutting mechanism, located between the two transfer mechanisms, which cuts the continuous spring row at specified lengths and at the same time it welds the sides of the non-woven material, which are created after the cutting, so that the springs are not released from their encasement, where after cutting, each spring row is held firmly by a longitudinal gripper (11), which is attached on the transfer frame (21), and it is carried near the warm glue tank, where the slender tank is at least as long as the spring row, and the glue is transferred on the surface of the non-woven material or cloth exactly where the springs are encased, through the appropriate number of stamps (8), which are equal to the number of encased springs (9), where the stamps sink inside the glue tank (5) in order to receive the glue, and then each glued spring row is carried on top of the previous row where it is pressed in order to be glued with the previous row, where upon consecutive gluing of rows, the total of the spring mattress (4) is produced, either with rectangular or cellular type arrangement of the spring rows.

10. Machine for the assembly of mattresses from continuous strips of pocketed springs as in claim 9, where the glue is applied on the surface of the rows with the encased springs (1), through flat or curved stamps of various dimensions, materials and shapes, which can carry the appropriate each time quantity of glue, where the stamps sink in the warm glue tank, and they retain the necessary glue quantity, which they apply by direct contact on pre-selected locations at the longitudinal rows.

11. Machine for the assembly of mattresses from continuous strips of pocketed springs as in claim 9, where the surfaces of the stamps can be inclined, thus being able to adapt to various inclinations of the surface to be stamped, so that better contact concerning the laying of the glue is achieved, whereas the springs that support the stamps provide the necessary elasticity for a better contact between the stamp surface and the surface of the spring row.

12. Machine for the assembly of mattresses from continuous strips of pocketed springs as in claim 9, where for the creation of a cellular type of arrangement of spring rows, two stamps with inclined surfaces which are tangent to the springs' convex surface are employed in order to stamp with glue the areas of a spring row is placed in a diagonal manner with respect to the previous row.

13. Machine for the assembly of mattresses from continuous strips of pocketed springs as in claim 9, where the slender glue tank is at least as long as the length of the spring rows to be glued, and it is placed parallel to and near the assembled rows, so that the traveled distance of the warm glue which is carried on the stamps' surfaces is short.

14. Machine for the assembly of mattresses from continuous strips of pocketed springs as in claim 9, where the stamps (8) are supported at one edge of the springs (9), which springs are supported on a shaft (6), which is located inside the glue tank and which extends at all the length of the glue tank, being able to rotate enforcing the

sinking of the stamps inside the warm glue, and then by further rotation, enforcing the emergence of the stamps above the glue surface, at a location where the transfer frame can lower the spring row, so that contact and stamping is obtained.

15. Machine for the assembly of innerspring units from pocketed springs as in claim 9, where the gripping of the row of springs is done by two rows of needles (75), which needles are positioned opposed to each other and may move towards and away from each other in order to hold and release the row of springs.

16. Machine for the assembly of innerspring units from pocketed springs as in claim 9, where the application of hot melt adhesive is done by elongate plates (72) which transport adhesive as they are submersed in a bath of molten adhesive and rise through translation or rotation and which metal plates deposit part of the adhesive they carry onto the convex, and flat surfaces of the pocketed springs.

17. Machine for the assembly of innerspring units from pocketed springs as in claim 9, where the application of the glue is done by a moving carrier (73) which travels underneath the row of springs, along the longitudinal axis of the row of springs, contains molten adhesive and includes at least three disk-shaped parts which are partly submersed in the adhesive and can rotate, transporting adhesive from the carrier to the convex, and flat surfaces of the springs.

18. Machine for the assembly of mattresses from continuous strips of pocketed springs as in claim 9, where the transfer frame (21), which is used to carry the spring rows (1), holds firmly the spring rows through a gripper (11), (12), then moves in a direction parallel to the longitudinal axis of the row and at the horizontal plane, and carries the spring rows above the elongated glue tank, where after the emergence of the stamps above the glue surface, the transfer frame lowers the attached spring row until simultaneous contact with all the stamps along the row length is obtained upon slight pressing and taking advantage of the elasticity of the stamps' springs, where after the gluing operation is completed, the transfer frame, moving horizontally, carries the glued row above the previous rows, and then moving downwards is pressing the new on the previous glued with each other rows, where after a while the transfer frame releases the gripping of the spring row and returns to its initial location, ready to repeat operation.

19. Machine for the assembly of mattresses from continuous strips of pocketed springs as in claim 9, where the cutting of strips made of non-woven material at the desired lengths is performed by two arms (63), (64), which can move vertically and opposite to each other, at a plane perpendicular to the longitudinal axis of the strip, which strip is gripped exactly between two encased springs, where one arm carries an electric resistance (27) extending at all its length, which resistance is placed on the heat resistant material meganite (28) or any other similar material, and where the other arm carries at the same length silicon (29) coated with Teflon (62), where after activation of the electric resistance the non-woven material melts, thus separating each strip at two pieces, whereas at the same time the four edges of the non-woven strip, two on each side of the cut, remain immobilized, since the forces that are pulling them are cancelled, and the cut and welded immobilized edges can be cooled

off and be re-welded again, one welding in each side of the cut, so that the springs remain still entrapped.

20. Machine for the assembly of innerspring units from pocketed springs as in claims 9, 16 and 17, which has two rolls of fabric or non-woven material which produce two sheets which sheets are fed either both or only one of them to the sides of the innerspring unit holder (68) which sheets are attached to the flat surfaces of the rows of springs, respectively, and which sheets are pulled by spiked wheels (66), which wheels pull a certain length of sheet, which length may be equal to, less than, or greater than the spring diameter, which machine has cutting mechanisms (67, 69) for slitting the sheets in directions along to and perpendicular to the direction of the sheet's motion, and which machine has cylinders (70, 71) which converge and diverge in order to increase and decrease the ripples on a sheet's surface.

21. Machine for the assembly of innerspring units from pocketed springs as in claims 9 and 20 which has two cylinders (70, 71) with sinusoidal lateral surfaces, which surfaces fit to each other, and which cylinders can move towards and away from each other in such a fashion that their longitudinal axes will always remain parallel to each other, forcing the fabric or non-woven which is located between them to copy their sinusoidal form, which form increases in amplitude as the distance of the cylinders' axes decreases and which amplitude may be zero when the cylinders are far apart from each other.

22. Machine for the assembly of innerspring units from pocketed springs as in claims 9, 16 and 17 which is capable of providing rows of pocketed springs to a gripper, which rows may have their springs pushed together or pulled apart to the extent allowed by the construction of the row of springs, which machine can attach the dense or sparse row of springs to sheets of fabric or non-woven, thus producing an innerspring unit which after exiting the machine, will rest to a state of increased stiffness or increased spring independence respectively, or a combination of the two depending on the section of the innerspring unit in which each method has been applied.

23. Innerspring construction made of rows of pocketed springs so that the rows of springs are attached to each other by means of one or two sheets of fabric or non-woven material, which fabric or non-woven material is adhered to the flat surfaces of the springs by means of adhesive which has been deposited on the flat surfaces, which fabric or non-woven material is rippled, with the ripples running along the length and along the width of the sheet, thus providing independence to the springs, proportional to the size of the ripples so that every spring can contract under pressure to the degree allowed by the ripples without pulling its neighboring springs.

24. Innerspring construction as in claim 23 which has ripples of varying amplitude along each dimension, where the ripples of each other side of the innerspring construction are independent of the ripples of the other side where the amplitudes of the ripples in each dimension are independent of the amplitudes in the other dimension.

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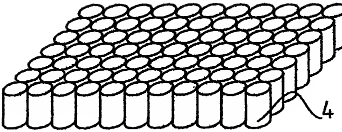

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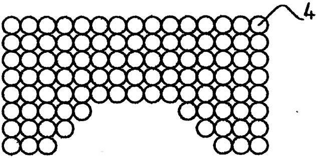

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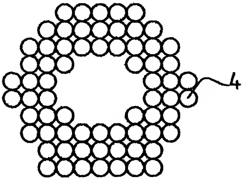

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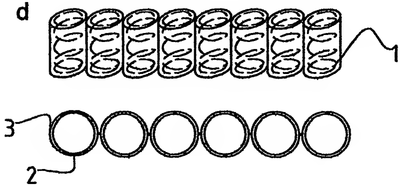

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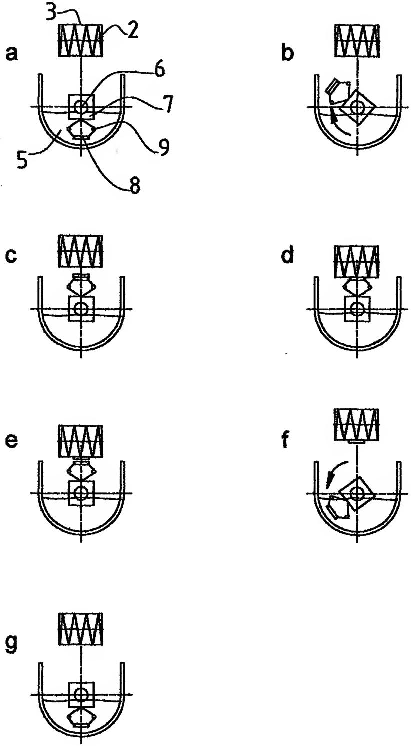

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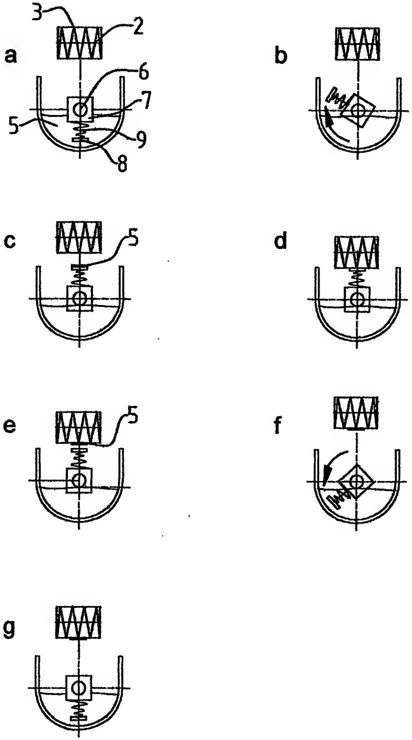

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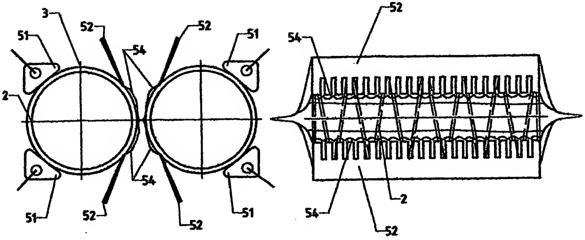

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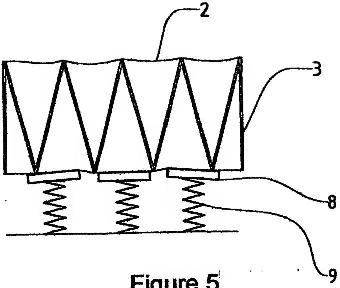

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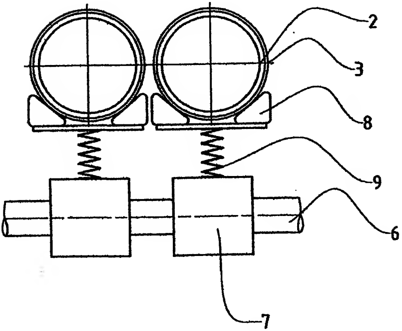

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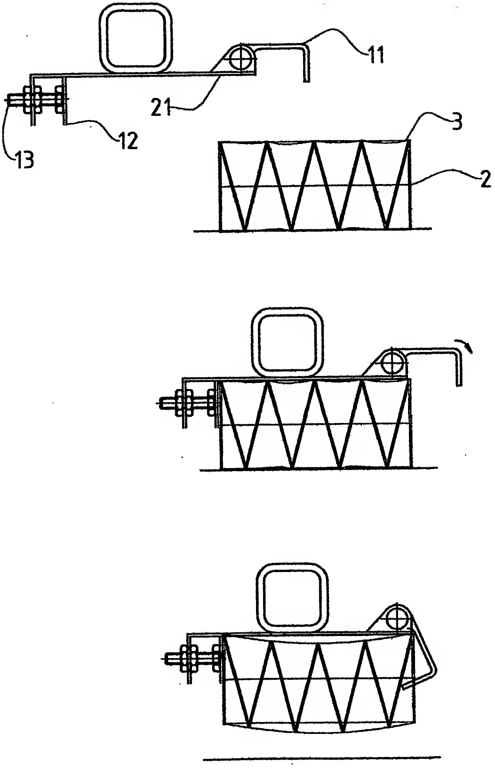

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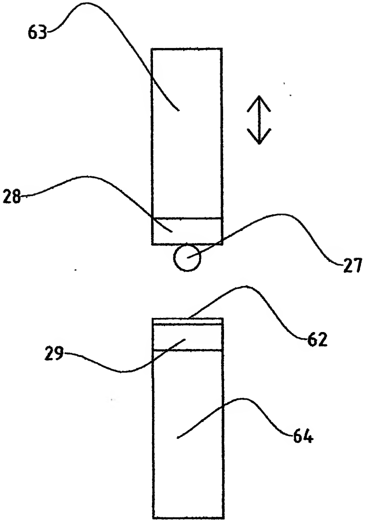

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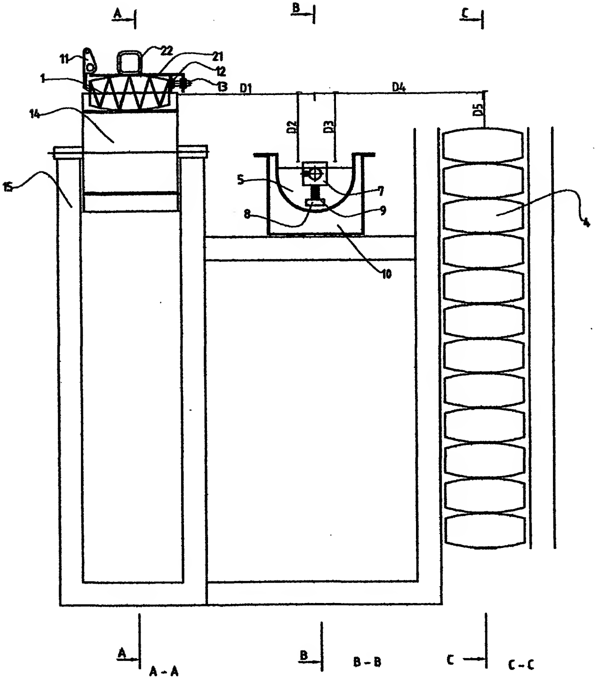

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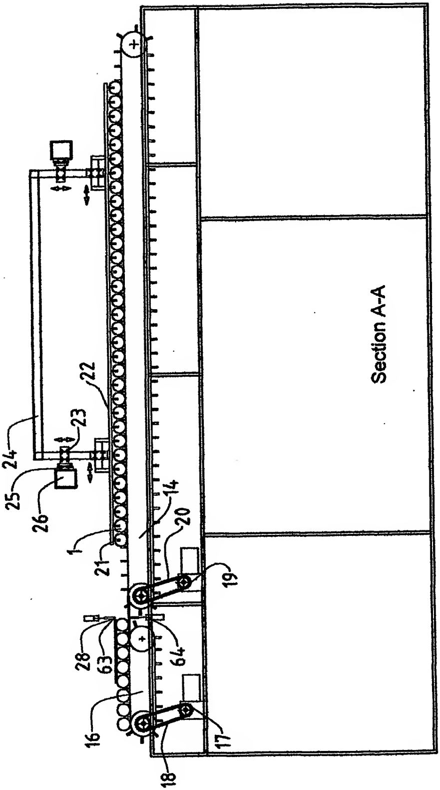

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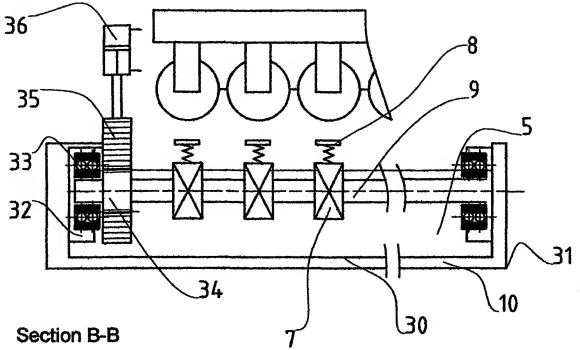
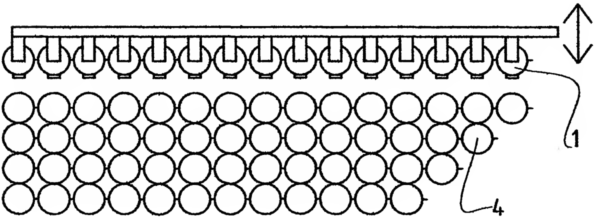


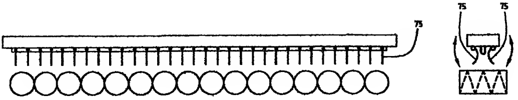
Section B-B

Figure 11



Section A-A

Figure 12



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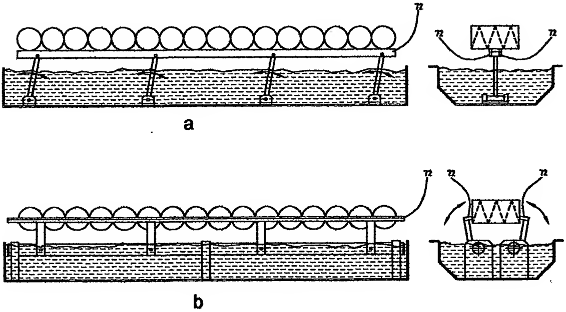

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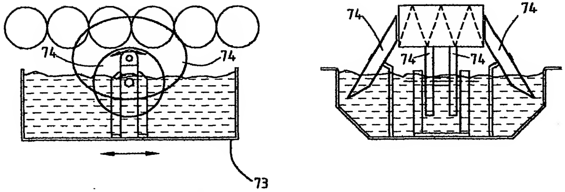

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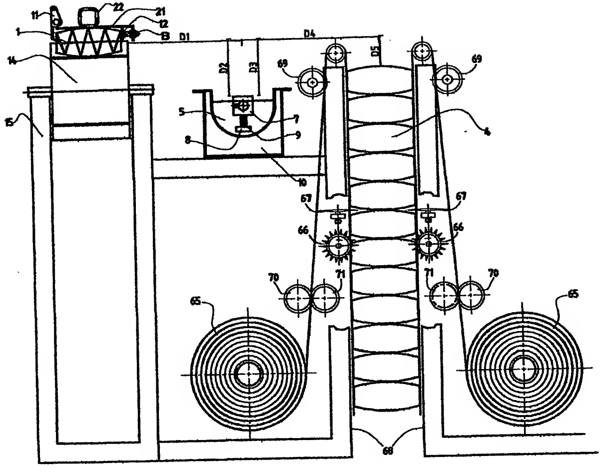
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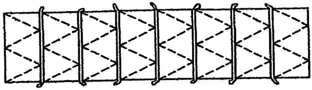
Figure 16



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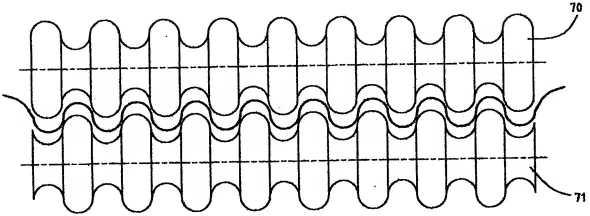

Figure 18